

What is claimed is:

1. A digital TV receiver, comprising:

an A/D converter converting an analog signal into a digital signal;

a carrier recovery converting the digital pass-band signal into a digital base-band signal;

and

a symbol clock recovery converting digital real/imaginary base-band component signals into OQAM type of real/imaginary component signals, detecting timing error information by performing the high pass-band filtering on the OQAM real/imaginary signals, and squaring and adding the filtered value, and for generating and outputting at least two times the frequency of the symbol clock corrected from the detected timing error information.
2. The digital TV receiver of claim 1, wherein the A/D converter converts the analog pass-band signal transmitted in a VSB modulation type into a pass-band signal by sampling the analog signal at a fixed frequency generated from the fixed oscillator or at least two times the frequency of the symbol clock.
3. The digital TV receiver of claim 1, wherein the carrier recovery multiplies the digital pass-band signal by a standard carrier signal generated through the carrier recovery process for converting the signal into the digital base-band signal.

4. The digital TV receiver of claim 1 further comprises a resampler for resampling the digital real/imaginary base-band signals to at least two times the frequency of the symbol clock frequency, and interpolating each of the signals.

5. The digital TV receiver of claim 5, wherein the symbol clock recovery comprises:

an OQAM converter converting each of the digital base-band real/imaginary signals interpolated and outputted from the resampler into OQAM real/imaginary component signals;

a high pass filter performing a high pass-band filtering on the OQAM real/imaginary component signals outputted from the OQAM converter for removing information of data section;

a squarer squaring each of the OQAM real/imaginary component signals filtered by and outputted from the high pass-band filter, and adding and outputting the calculation;

a pre-filter passing only a frequency of a predetermined band from the output of the squarer for recovering the symbol clock;

a timing error detector detecting timing error information from the output of the pre-filter;

a filtering member filtering only a low pass-band signal from the timing error information outputted from the timing error detector; and

an NCO generating at least two times the frequency of the symbol clock interpolated according to low pass-band components of the filtered timing error information and outputting to the first resampler.

6. The digital TV receiver of claim 6, wherein the OQAM converter multiplies digital base-band real/imaginary component signals interpolated and outputted from the resampler by a fixed frequency with a center frequency of 2.690559MHz for converting digital base-band real/imaginary component signals into the OQAM real/imaginary component signals.

7. The digital TV receiver of claim 6, wherein the pre-filter filters frequency subgroup half of the frequency of the symbol clock for the output of the squarer.

8. The digital TV receiver of claim 1, wherein the symbol clock recovery comprises:

an OQAM converter converting each of the digital base-band real/imaginary signals outputted from the carrier recovery into OQAM real/imaginary component signals;

a high pass filter performing a high pass-band filtering on the OQAM real/imaginary component signals outputted from the OQAM converter for removing information of data section;

a first squaring operator squaring each of the OQAM real/imaginary component signals filtered by and outputted from the high pass filter, and calculating difference of the two squared signals and squaring the calculation;

a second squaring operator squaring each of the OQAM real/imaginary component signals filtered by and outputted from the high pass filter, and calculating and squaring a difference of the two squared signals;

an adder adding the output of the first and second squaring operators;

a pre-filter passing only a frequency of a predetermined band for recovering the symbol clock from the output of the adder;

a timing error detector detecting timing error information from the output of the pre-filter;

a filtering member filtering only the low pass-band signal from the timing error information outputted from the timing error detector; and

an NCO for generating at least two times the frequency of the symbol clock recovered according to low pass-band signals of the filtered timing error information and outputting to the first resampler.

9. The digital TV receiver of claim 8, wherein the OQAM converter multiplies the VSB digital base-band real/imaginary component signals outputted from the carrier recovery by the fixed frequency with a center frequency of 2.690559MHz for converting the VSB digital base-band real/imaginary component signals into the OQAM real/imaginary component signals.

10. The digital TV receiver of claim 8, wherein the pre-filter filters frequency subgroup half of the frequency of the symbol clock for the output of the squarer.

11. A digital TV receiver, comprising:

an A/D converter converting an analog signal into a digital signal;

a carrier recovery converting the digital pass-band signal into a digital base-band signal;

a resampler resampling digital base-band real/imaginary component signals outputted from the carrier recovery to at least two times the frequency of the symbol clock and interpolating each of the signals;

an OQAM converter converting each of the digital base-band real/imaginary signals interpolated and outputted from the resampler into OQAM real/imaginary component signals;

a high pass filter performing a high pass-band filtering on the OQAM real/imaginary component signals outputted from the OQAM converter for removing information of data section;

a squarer squaring each of the OQAM real/imaginary component signals filtered by and outputted from the high pass-band filter, and adding and outputting the calculation;

a pre-filter passing only a frequency of a predetermined band from the output of the squarer for recovering the symbol clock;

a timing error detector detecting timing error information from the output of the pre-filter;

a filtering member filtering only a low pass-band signal from the timing error information outputted from the timing error detector; and

an NCO generating at least two times the frequency of the symbol clock interpolated according to low pass-band components of the filtered timing error information and outputting to the first resampler.

12. The digital TV receiver of claim 11, wherein the A/D converter converts the analog pass-band signal transmitted in a VSB modulation type into a pass-band signal by sampling the

analog signal at a fixed frequency generated from the fixed oscillator or at least two times the frequency of the symbol clock.

13. The digital TV receiver of claim 11, wherein the carrier recovery multiplies the digital pass-band signal by a standard carrier signal generated through the carrier recovery process for converting the signal into the digital base-band signal.

14. The digital TV receiver of claim 11, wherein the OQAM converter multiplies digital base-band real/imaginary component signals interpolated and outputted from the resampler by a fixed frequency with a center frequency of 2.690559MHz for converting digital base-band real/imaginary component signals into the OQAM real/imaginary component signals.

15. The digital TV receiver of claim 6, wherein the pre-filter filters frequency subgroup half of the frequency of the symbol clock for the output of the squarer.

16. A digital TV receiver, comprising:
an A/D converter converting an analog signal into a digital signal;
a carrier recovery converting the digital pass-band signal into a digital base-band signal;
a resampler resampling digital base-band real/imaginary component signals outputted from the carrier recovery to at least two times the frequency of the symbol clock and interpolating each of the signals;

an OQAM converter converting each of the digital base-band real/imaginary signals interpolated and outputted from the resampler into OQAM real/imaginary component signals;

a high pass filter performing a high pass-band filtering on the OQAM real/imaginary component signals outputted from the OQAM converter for removing information of data section;

a first squaring operator squaring each of the OQAM real/imaginary component signals filtered by and outputted from the high pass filter, and calculating difference of the two squared signals and squaring the calculation;

a second squaring operator squaring each of the OQAM real/imaginary component signals filtered by and outputted from the high pass filter, and calculating and squaring a difference of the two squared signals;

an adder adding the output of the first and second squaring operators;

a pre-filter passing only a frequency of a predetermined band for recovering the symbol clock from the output of the adder;

a timing error detector detecting timing error information from the output of the pre-filter;

a filtering member filtering only the low pass-band signal from the timing error information outputted from the timing error detector; and

an NCO for generating at least two times the frequency of the symbol clock recovered according to low pass-band signals of the filtered timing error information and outputting to the first resampler.

17. The digital TV receiver of claim 16, wherein the A/D converter converts the analog pass-band signal transmitted in a VSB modulation type into a pass-band signal by sampling the analog signal at a fixed frequency generated from the fixed oscillator or at least two times the frequency of the symbol clock.

18. The digital TV receiver of claim 16, wherein the carrier recovery multiplies the digital pass-band signal by a standard carrier signal generated through the carrier recovery process for converting the signal into the digital base-band signal.

19. The digital TV receiver of claim 16, wherein the OQAM converter multiplies digital base-band real/imaginary component signals interpolated and outputted from the resampler by a fixed frequency with a center frequency of 2.690559MHz for converting digital base-band real/imaginary component signals into the OQAM real/imaginary component signals.

20. The digital TV receiver of claim 16, wherein the pre-filter filters frequency subgroup half of the frequency of the symbol clock for the output of the squarer.